18. The method of claim 16 wherein receiving the first image data of the component prior to installation of the one or more features comprises receiving the first image data of a representative component prior to the installation of the one or more features.

19. The method of claim 16 further comprising determining the placement of a three-dimensional inspection component based upon the location of each of the one or more features.

20. The method of claim 19 wherein determining the placement of the three-dimensional inspection component comprises determining the location of a laser track.

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21. The method of claim 16 wherein determining the location of each of the one or more features from the difference data comprises using the difference data to locate an edge of one or more of the features in locations where a value of brightness data of an area in the first image data is close to a value of brightness data of an area in the second image corresponding to one of the features.

REMARKS

Claims 1 through 21 are pending. In an office action mailed September 4, 2002, claim 5 was rejected under 35 U.S.C. 112 as having incomplete sentence structure. Claims 7, 12, 13, and 20 were rejected under 35 U.S.C. 112 on the grounds that the specification allegedly provides conflicting descriptions for the terms "laser track" and "laser inspection track." Claims 1 through 20 stands rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,173,070 granted to Michael et al (hereinafter "*Michael*"), further in view of U.S. Patent 6,298,149 granted to Nichani et al. (hereinafter "*Nichani*"). Claims 16 through 18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Nichani*.

Claim Rejections Under 35 U.S.C. 112

Claim 5 stands rejected under 35 U.S.C. 112 as having incomplete sentence structure. Claims 7, 12, 13, and 20 stand rejected under 35 U.S.C. 112 on the grounds that the specification allegedly provides conflicting descriptions for the terms "laser track" and "laser inspection track." These rejections are respectfully traversed.

Claim 5 has been non-substantively amended to correct the typographical error in the omission of the word "comprises." The Applicants note that the Examiner properly interpreted the claim for examination despite the typographical error.

Regarding the alleged conflicting descriptions of the terms "laser track" and "laser inspection track," the Applicants believe that there is no such conflicting description used in the specification. For example, the term "laser track" is described in the Specification at Page 8, lines 13-17 as such: "In one exemplary embodiment, the three-dimensional inspection of the component is performed by placing a laser track (such as is formed by tracing a laser beam back and forth repeatedly over a track having a predetermined length) over the one or more features." It is also noted in the Background section that: "Such three-dimensional analysis can require placing a three-dimensional sensing component, such as a laser track, on features of the component. Image data from the feature, **as illuminated by the three-dimensional sensing component**, is then analyzed so as to determine the coordinates in three dimensions of the illuminated feature." (Emphasis added). The Applicants believe that it is clear from this description what a laser track is. The section referred to in the office action (page 14, paragraph 3) is not to the contrary:

> In operation, system 300 is used to perform a three dimensional analysis of a component to locate the position and size of three-dimensional features. System 300 uses feature coordinate data from a two dimensional analyzer system to determine optimal placement of three dimensional analysis components, such as laser tracks. In this manner, system 300 allows a piece to be inspected for three-dimensional data without operator intervention after the two dimensional analysis.

Withdrawal of the rejection under 35 U.S.C. 112 is respectfully requested.

Claim Rejections Under 35 U.S.C. 103

Claims 1 through 20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Michael* further in view of U.S. Patent 6,298,149 granted to Nichani et al. (hereinafter "*Nichani*"). Claims 16 through 18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Nichani*. In particular, it is stated that *Michael* discloses that 2D coordinate data may be generated by Golden Template Comparison (GTC) and combined with 3D data, and that "[f]ollowing the acquisition of the 3D data, one embodiment in Michael involves the use of a robotic arm which manipulates the inspection device (col. 4, ln. 33). Thus because the 3D data may be used to control other components, such may be characterized as 'control data.'" These rejections are respectfully traversed.

Michael in view of *Nichani* fails to provide a prima facie basis for the rejection of claims 1 through 20, as they fail to disclose each feature of the claimed invention. In particular, claim 1 includes "a two dimensional inspection system locating a plurality of features on the component and generating feature coordinate data; and a three dimensional inspection system coupled to the two dimensional inspection system, the three dimensional inspection system receiving the feature coordinate data and generating inspection control data." *Michael* fails to disclose the use of 2D or 3D data for controlling anything, much less the generation of inspection control data. The cited sections of *Michael* states that the "devices for inspection 20 which include objects 21 are positioned to be inspected by an image acquisition device 24, such as a 3D camera or a confocal microscope. The inspection device 20 can be positioned for example by a robotic manipulator arm 22, which picks up the inspection device 20 from a surface 25. . . . The image acquisition device 24 images the surface of the inspection device 20 and produces 3D image data, which is distinct from 2D grey scale image data." *Michael*, col. 4, lines 27-43. Furthermore, the reference to Golden Template Comparison in Michael only occurs after 3D data is generated, not 2D data. Golden Template Comparison can be performed using 3D data. There is no suggestion in *Michael* that Golden Template Comparison requires 2D data, nor is there any way to generate such 2D data using the system disclosed in *Michael*. Thus, the following is apparent from the cited sections of *Michael*:

1. 2D data is not obtained, and is in fact distinguished over by *Michael*, such that *Michael* teaches away from a combination with any systems that require generation of 2D data.
2. The robotic arm 22 of *Michael* positions the inspection device 20 prior to the generation of the 3D data.
3. *Michael* therefore does not disclose generating feature coordinate data and using the feature coordinate data to generate inspection control data.
4. All control data (i.e. the robot arm control data as cited) is generated by the system of *Michael* prior to generation of any inspection data.
5. Any coordinate data is obtained from 3D data, not from 2D data.

Even assuming, *arguendo*, that the robot arm control data of *Michael* is generated after the generation of coordinate data, inspection control data is not necessarily robot arm control data. Robot arm control data typically is predetermined, and assumes that an inspection piece will be in a predetermined location, such as in a predetermined spot on a conveyor belt, in a depression in a tray having known dimensions, etc. If the inspection piece is misaligned on the conveyor belt or in the tray, then the robot arm simply fails to pick it up – no mechanism typically exists for the robot arm to be moved to where the inspection piece is, due to the processing time required to calculate motion control data for the robot arm from image data. Thus, it is possible that innovations in controlling a robot arm to move to an inspection piece that is so misaligned could be developed, but such innovations would not necessarily be inspection control data but rather inspection piece acquisition control data. In one exemplary embodiment, if the robot arm was controlled after a two dimensional inspection system located a plurality of features on the component and generated feature coordinate data; and after a three dimensional inspection system coupled to the two dimensional inspection system received the feature coordinate data and generated inspection control data, then the robot arm control data might be inspection control data assuming that the inspection control data was used to control the robot arm. But *Michael* in view of *Nichani* fails to disclose each of those elements, much less to make a combination of those separate elements obvious.

In regards to claim 2, *Michael* in view of *Nichani* fails to disclose a component inspection controller coupled to the three dimensional inspection system, the component inspection controller receiving the inspection control data and controlling the location of the component

based upon the inspection control data. Again, *Michael* in view of *Nichani* discloses generating 3D data after control data has been used to move a robot arm and provides no suggestion to combine 2D inspection systems with 3D inspection systems. Therefore, *Michael* in view of *Nichani* can not and does not disclose a component inspection controller receiving inspection control data from a three dimensional inspection system and controlling the location of the component based upon the inspection control data This feature is missing in its entirety from *Michael* in view of *Nichani*, and therefore, *Michael* in view of *Nichani* does not provide a prima facie basis for the rejection of claim 2.

In regards to claim 6, *Michael* in view of *Nichani* fails to disclose a feature location tracking system storing the feature location data and providing the feature location data to the three dimensional inspection system after all features of the component are located.

Claim 9 includes "processing two dimensional image data of the component to determine location data for each of a plurality of features on the component; determining control data for a three dimensional inspection of the component from the location data for each of the plurality of features; and performing a three dimensional inspection of the component using the control data." Thus, the process of *Michael* in view of *Nichani*, where control of the robot arm occurs prior to generation of 3D data, and where there is no suggestion to combine 2D inspection systems with 3D inspection systems, has no bearing at all on the invention of claim 9.

In regards to claim 10, *Michael* in view of *Nichani* fails to disclose comparing test image data to die base reference image data to generate difference data; and analyzing the difference data to determine the location of each of the plurality of features. The GTC process used by *Nichani* is a **defect** location process, not a **feature** location process. In other words, once the **defect** is located using the GTC process of *Nichani*, the inspection process is completed, but in one exemplary embodiment, after the **feature** is located using the invention of claim 10, control data is determined for a three dimensional inspection of the component from the location data for each of the plurality of features, and a three dimensional inspection of the component is performed using the control data.

In regards to claim 11, *Michael* in view of *Nichani* fails to disclose comparing test image data to test die reference image data to generate difference data; and analyzing the difference data to determine the location of each of the plurality of features. Again, the GTC process used by *Nichani* is a **defect** location process, not a **feature** location process.

In regards to claim 13, *Michael* in view of *Nichani* fails to disclose determining placement sequence data for a laser inspection track such that the laser inspection track is placed on each of the plurality of features at least once; and determining component movement control data from the placement sequence data. In fact, the word "laser" is absent from both *Michael* and *Nichani*. *Michael* in view of *Nichani* simply can not be used to reject claim 12 under 35 U.S.C. 103 when one or more elements from the claim are completely absent from either reference.

In regards to claim 12, *Michael* in view of *Nichani* fails to disclose obtaining image data from a laser inspection track on the component; and analyzing the image data to determine the location of one or more features. Again, the word "laser" is absent from both *Michael* and *Nichani*, and *Michael* in view of *Nichani* simply can not be used to reject claim 12 under 35 U.S.C. 103 when one or more elements from the claim are completely absent from either reference.

In regards to claim 16, *Nichani* fails to disclose each element of the claimed invention. Claim 16 includes "receiving first image data of a component prior to installation of one or more features; receiving second image data of the component after the installation of the one or more features; comparing the first image data and the second image data to generate difference data; and determining the location of each of the one or more features from the difference data." *Nichani* utterly fails to disclose these steps, and therefore cannot anticipate claim 16 under 35 U.S.C. 103. It is stated that *Nichani* "discloses a method known in the art as Golden Template Comparison. . . . it is common sense that if one were to make a comparison which would identify the new features of the object, one would make an image of the unsoldered workpiece before soldering, and then compare the image subsequently." However, *Nichani* entirely fails to disclose this alleged "common sense" process, which is in fact nothing other than one exemplary

embodiment of what can be accomplished using the method of claim 16. Applicants respectfully note that the test for obviousness under 35 U.S.C. 103 is not whether the claimed invention is "common sense," but whether two or more references disclose each of the elements of the invention, and a motive for the combination of the references.

Nichani states that "GTC is a technique for locating objects by comparing a feature under scrutiny (to wit, a lead frame) to a good image--or golden template--that is stored in memory. The technique subtracts the good image from the test image and analyzes the difference to determine if the expected object (e.g., a defect) is present." *Nichani*, col. 2, lines 9-11. *Nichani* therefore discloses taking an image of how something is supposed to look and subtracting from it an image of how it looks to determine whether any **defects** are present, at which point the defect detection process is completed. The rejection of claim 16 over *Nichani* is therefore improper, because *Nichani* fails to disclose that the location of each of one or more **features** can be determined from difference data after receiving first image data of a component prior to installation of the one or more features, receiving second image data of the component after the installation of the one or more features, and comparing the first image data and the second image data to generate difference data, at which point additional process can be implemented, such as the inspection of the located features using a three dimensional inspection system or other suitable processes. The method of claim 16 is thus different from taking an image of how something is supposed to look and subtracting it from an image of how something looks to determine whether any defects are present, namely, in the realization that the process can be used to locate of features (such as to perform subsequent processes based on the location of features), instead of to location of defects after which time all subsequent processing for the component is terminated. *Nichani* fails to disclose that the **defect** location process could be modified in any manner to detect the location of a **feature**, nor any reason why such a modification would be desirable, and thus fails to provide a prima facie basis under 35 U.S.C. 103 for the rejection of claim 16.

New claim 21 is presented herein for examination, and includes the method of claim 16 wherein determining the location of each of the one or more features from the difference data

comprises using the difference data to locate an edge of one or more of the features in locations where a value of brightness data of an area in the first image data is close to a value of brightness data of an area in the second image corresponding to one of the features. In one exemplary embodiment, the invention of claim 21 can be used to detect an edge of a feature in image data where it would otherwise be difficult to detect an edge, such as where the brightness data for pixels in an area prior to the installation of a feature is similar to the brightness data for pixels of the feature that is installed. In such an exemplary embodiment, the detection of an edge in the second set of image data alone may be difficult or impossible, whereas the detection of an edge in the difference data would be possible.

CONCLUSION

In view of the foregoing remarks and for various other reasons readily apparent, Applicants submit that all of the claims now present are allowable, and withdrawal of the rejections and a Notice of Allowance are courteously solicited.

If any impediment to the allowance of the claims remains after consideration of this amendment, and such impediment could be alleviated during a telephone interview, the Examiner is invited to telephone the undersigned at (214) 969-4669 so that such issues may be resolved as expeditiously as possible.

A check for an additional fee of $18.00 for one claim in excess of 20 is included with this response. If any applicable fee or refund has been overlooked, the Commissioner is hereby authorized to charge any fee or credit any refund to the deposit account of Akin, Gump, Strauss, Hauer & Feld, L.L.P., No. 01-0657.

Respectfully Submitted,

Date: December 4, 2002

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CLAIMS AS AMENDED AND SHOWING CHANGES MADE

5. **(AMENDED)** The system of claim 3 wherein the reference image system **comprises** a test die reference image system storing image data of a test die with installed bumps.

21. **(NEW)** The method of claim 16 wherein determining the location of each of the one or more features from the difference data comprises using the difference data to locate an edge of one or more of the features in locations where a value of brightness data of an area in the first image data is close to a value of brightness data of an area in the second image corresponding to one of the features.